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09/129,113 08/04/98 CAMERON

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EXAMINER

GILMORE, B

ART UNIT

PAPER NUMBER

1752

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/129,113

Applicant(s)

Cameron et al

Examiner

Barbara Gilmore

Group Art Unit

1752



☒ Responsive to communication(s) filed on amendment filed 11/23/1999

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) 1-26 and 31-42 is/are pending in the application

Of the above, claim(s) _____ is/are withdrawn from consideration

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-21, 23-26, and 31-42 is/are rejected.

☒ Claim(s) 1, 21, 22, 37, and 38 is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

— SEE OFFICE ACTION ON THE FOLLOWING PAGES —

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DETAILED ACTION

Response to Amendment

1. The amendment filed 11/23/99 has been entered.
2. The 103(a) rejection of claims 1-11, 17, 19-21, 25-27 and 31-34 over Ohsawa et al has been withdrawn. The 103(a) rejection of claims 1-27 and 31-33 over Sinta et al in view of Daniels et al and Clecak et al has been withdrawn.

Claim Objections

3. Claim 22 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.
 - a. Claim 1 has been amended to include the limitations of claim 22. Please cancel claim 22.
4. Claims 37 and 38 are duplicative of claims 1 and 21. Applicant is required to cancel one set of claims.

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Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-11, 17, 19-21, 25-26 and 31-36, 40-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohsawa et al in view of Wengenroth et al.

a. In U.S. Patent No. 5,847,218, Ohsawa et al teach a chemically amplified positive resist composition comprising an organic solvent, an alkali soluble resin and a sulfonium salt having a substituted or unsubstituted arylsulfonate anion wherein each of the substituents of the sulfonium salt is substituted or unsubstituted aromatic group (claims 1 and 4) including phenyl, alkoxyphenyl groups and alkylphenyl groups wherein alkyl group having 1 to 8 carbon atoms are exemplified (column 5, lines 23-57). The substituted aromatic groups may have a substituent at any of o-, m- and p- positions, with p- substituted groups ~~possessing~~ having high molecular crystallinity or symmetry (column 6, lines 20-26). The aryl sulfonate may be substituted with a hydrogen atom, alkyl group or alkoxy group. The alky groups are preferably normal and branched alkyl groups having 1 to 12 carbon atoms and the alkoxy groups are preferably those having 1 to 8 carbon atoms (column 6, lines 27-37). An example of the sulfonium salt and sulfonate anion is given in formula 1c (column 15, lines 11-23). Examples of the alkali soluble

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resin include polyhydroxystyrene and derivatives thereof. Preferred are those polyhydroxy derivatives wherein hydroxy atoms of some OH groups of polyhydroxystyrene are replaced by acid labile groups and hydroxystyrene copolymers including 1-ethoxyethyl. In column 27, lines 30-34, Ohsawa et al teach coating the composition of examples 1-15 onto a silicon wafer using a suitable solvent including propylene glycol monomethyl ether acetate (column 16, lines 25-26). Ohsawa et al does not exemplify propylene glycol monomethyl ether acetate however, it is well known in the photosensitive art to use propylene glycol monomethyl ether acetate as a solvent in microelectronics.

b. In US Patent No. 5,498,506, Wengenroth et al teach a radiation sensitive mixture used in the production of electronic elements, said composition comprising a binder, a compound which forms an acid under the action of actinic radiation and a compound which contains at least one C-O-C or C-O-Si bond which can be cleaved by an acid (abstract). The radiation sensitive mixture is dissolved in a solvent or a combination of solvents. Particularly suitable and preferred solvents are glycols such as propylene glycol methyl ether acetate (column 5, line 66-column 6, line 19). Wengenroth et al exemplifies propylene glycol monomethyl ether acetate in Examples 1-22.

c. Therefore it is the Examiner's position, it would have been *prima facie* obvious to one of ordinary skill in the photosensitive art to coat a silicon wafer with a chemically amplified positive resist composition comprising an alkali soluble resin comprising acid labile groups and a sulfonium salt having substituted or unsubstituted arylsulfonate anion dissolved in propylene

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glycol methyl ether acetate with reasonable expectation of obtaining a chemically amplified positive resist composition having sufficiently high resolution to comply with a fine patterning technique based on the teachings of Ohsawa et al (column 3, lines 42-49) in view of Wengenroth et al.

7. Claims 1-21, 24-26 and 31-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sinta et al in view of Wengenroth et al, Daniels et al and Clecak et al.

a. In U.S. Patent No. 5,731,364, Sinta et al teach a photoresist composition comprising a resin binder and a photoactive component, the photoactive component comprising a plurality of distinct aryl sulfonium photoactivatable compounds (claim 1). The invention provides a photoactive component that includes multiple cation sulfonium photoactive compounds that are a carboxylate or sulfonate salt (column 3, lines 24-38) and when used in either positive acting or negative acting photoresist compositions can exhibit excellent lithographic properties (column 1, lines 56-59). Suitable counter ions are given in column 4, line 28 - column 6, line 51 including alkyl sulfonates such as mesylate, aryl tosylates and halogenated alkyl sulfonates such as triflate. Sinta et al do not expressly teach substituted triphenylsulfonium salts. The resin binder has functional groups that impart alkaline aqueous developability to the resist composition. Preferred are resin binders that comprise polar functional groups such as hydroxyl or carboxylate (column 7, line 38 - 50). A substituted ester moiety, taught as a suitable acid labile groups of the resin is described in column 9, lines 23-27. Preferred acid labile moieties are acetate groups including t-

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butyl acetate groups and acetals and ketals (column 9, lines 44 - 49). A resist of the invention can be prepared as a coating composition by dissolving the components of the photoresist in a suitable solvent such as propylene glycol monomethyl ether and lactates such as ethyl or methyl lactate (column 11, lines 10-26). Sinta et al further teach that the photoresists may be applied as a liquid coating to a substrate (column 11, lines 27-32).

b. In US Patent No. 5,498,506, Wengenroth et al teach a radiation sensitive mixture used in the production of electronic elements, said composition comprising a binder, a compound which forms an acid under the action of actinic radiation and a compound which contains at least one C-O-C or C-O-Si bond which can be cleaved by an acid (abstract). To coat a substrate, the radiation sensitive mixture is dissolved in a solvent or a combination of solvents. Particularly suitable and preferred solvents are glycols such as propylene glycol methyl ether acetate (column 5, line 66-column 6, line 19). Wengenroth et al exemplifies propylene glycol monomethyl ether acetate in Examples 1-22. Suitable substrates are all materials of which capacitors, semiconductors, multilayer printed circuits or integrated circuits consist or from which they can be produced including silicon substrates (column 6, lines 28-44).

c. In U.S. Patent No. 5,397,685, Daniels et al teach a light sensitive composition comprising a binder that is a mixture of a phenolic resin and a photoactive compound capable of generating a curing catalyst (abstract). Preferred onium photoactive compounds, given in column 4, lines 41-68, include sulfonium complex salts. Specifically, triphenylsulfonium tetrafluoroborate, dimethylphenylsulfonium hexafluorophosphate, tritolysulfonium

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hexafluorophosphate and 4-butoxyphenyldiphenylsulfonium tetrafluoroborate. With respect to claim 4, it is the Examiner's position that it is well known in the photosensitive art to use substituted sulfonium salts as photoacid generators based on the teachings of Daniels et al.

d. In U.S. Patent No. 5,322,765, Clecak et al teach a dry developable photoresist composition which comprise an admixture of a film forming aromatic polymer resin, an acid catalyzable agent, and a radiation degradable acid generating compound (abstract). Preferred acid generators include tri(t-butylphenyl)sulfonium hexafluoroantimonate, tri(t-butyl-phenyl)sulfonium hexafluoroarsenate and tri(t-butyl-phenyl)sulfonium triflate (claims 14-19). With respect to claim 8, it is the Examiner's position that it is well known in the photosensitive art to use substituted triphenyl sulfonium salts as photoacid generators based on the teachings of Clecak et al. With respect to claim 9, the teachings of Clecak et al does not include triphenyl sulfonium salts substituted with different groups however, the Examiner also asserts that it would have been a matter of design choice for one of ordinary skill in the photosensitive art to use a triphenyl sulfonium salt substituted wherein only one phenyl group is substituted. Further the Examiner asserts that para substitution of the triarylsulfonium salt would have been obvious to one of ordinary skill in the art due to sulfur's ortho, para directing characteristics (claim 10).

e. Therefore it is the Examiner's position it would have been *prima facie* obvious to coat a silicon wafer with a photosensitive composition comprising a binder resin with acid labile groups, a solvent such as propylene glycol monomethyl ether acetate and a photoacid generator such as 4-butoxyphenyldiphenylsulfonium tetrafluoroborate or tri(t-butyl-phenyl)sulfonium triflate

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wherein the sulfonium salt may comprise a sulfonate as a counter ion with reasonable expectation of reproducing structural details in the submicron range (Wengenroth et al; column 3, lines 18-22) based on the teachings of Sinta et al in view of Wengenroth et al, Daniels et al and Clecak et al.

8. Claims 1-12, 17, 19-26, 31-41 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoai et al in view of Wengenroth et al.

a. In U.S. Patent No. 5,693,452, Aoai et al teach a positive chemically amplified resist composition, comprising (a) a compound which generates an acid upon irradiation with active light or radiant ray; (b) a resin insoluble in water but soluble in an aqueous alkali solution and (c) a low molecular acid-decomposable dissolution inhibitor which increases its solubility in an alkali developer by the action of an acid and (d) a resin having an acid-decomposable alkyl ester group (abstract). The resin having an acid-decomposable alkyl ester group is described further in column 42, line 22 - column 47, line 25. Sulfonium salts represented by formula PAG4 are particularly effective as compound (a). R^3 , R^4 and R^5 each independently represents a substituted or unsubstituted alkyl or aryl group, preferably an aryl group having from 6 to 14 carbon atoms, an alkyl group having from 1 to 8 carbon atoms or a substitution derivative thereof. Examples of the counter anion, Z^- , include naphthalene-1-sulfonic acid ion (column 32, lines 29-63). Examples of the solvent for dissolving the resist composition include propylene glycol methyl ether acetate however, Aoai et al does not exemplify propylene glycol methyl ether acetate (column 51, lines 4-19). The resist composition is coated on a substrate as used in producing a

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precision integrated circuit element such as silicon/silicon dioxide-covered substrate (column 53, lines 10-14).

b. As indicated in paragraph 6b., Wengenroth et al teach a radiation sensitive mixture used in the production of electronic elements with the expectation of reproducing structural details in the submicron range. This radiation sensitive mixture is preferably dissolved in propylene glycol methyl ether acetate and coated onto a wafer. Propylene glycol methyl ether acetate is exemplified in Examples 1-22.

c. Therefore it is the Examiner's position it would have been *prima facie* obvious to one of ordinary skill in the photosensitive art to use propylene glycol methyl ether acetate to coat the radiation sensitive mixture of Aoai et al, with reasonable expectation of reproducing structural details in the submicron range based on the teachings of Wengenroth et al.

Response to Arguments

9. Applicant's arguments filed 11/23/99 have been fully considered but they are not persuasive.

10. Applicant's arguments with respect to claims 1-26 and 31-33 have been considered but are moot in view of the new ground(s) of rejection.

a. The Examiner has cited an additional reference, Wengenroth et al, in addition to the references cited in the previous office action. This reference has been cited to show it is obvious and well known to those of ordinary skill in the art to use propylene glycol methyl ether

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acetate to coat various resist materials. Further, propylene glycol methyl ether acetate is the only solvent used in Examples 1-22 of the prior art. Therefore, the Applicant's argument with respect to the non-hydroxylic solvent is not persuasive.

b. The Examiner respectfully disagrees with the Applicant's assertion that the skilled artisan would not readily import the disclosure of negative working photoresists as in Daniels et al and Clecak et al. The Examiner is not importing the components essential to making the photoresist of Daniels et al and Clecak et al negative working. Daniels et al and Clecak et al were cited to show that alkoxy sulfonium and triaryl sulfonium photoacid generators are common and well known. Photoacid generators of this type are used in the chemically amplified positive resist of Ohsawa et al as well. As in paragraph 6 a. above, Ohsawa et al teach sulfonium photoacid generators having a substituted or unsubstituted arylsulfonate anion wherein each of the substituents of the sulfonium salt is substituted or unsubstituted aromatic group (claims 1 and 4) including phenyl, alkoxyphenyl groups and alkylphenyl groups wherein alkyl group having 1 to 8 carbon atoms are exemplified (column 5, lines 23-57). The substituted aromatic groups may have a substituent at any of o-, m- and p- positions, with p- substituted ones having high molecular crystallinity or symmetry (column 6, lines 20-26). The aryl sulfonate may be substituted with a hydrogen atom, alkyl group or alkoxy group. The alkyl groups are preferably normal and branched alkyl groups having 1 to 12 carbon atoms and the alkoxy groups are preferably those having 1 to 8 carbon atoms (column 6, lines 27-37). An example of the sulfonium salt and sulfonate anion is given in formula 1c (column 15, lines 11-23). ~~Therefore it is the Examiner's position it would have been *prima facie* obvious to one of ordinary skill in the photosensitive art~~

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~~preferably those having 1 to 8 carbon atoms (column 6, lines 27-37). An example of the sulfonium salt and sulfonate anion is given in formula 1c (column 15, lines 11-23).~~ Therefore it is the Examiner's position it would have been *prima facie* obvious to one of ordinary skill in the photosensitive art to use the Photoacid generator of Daniels et al or Clecak et al in addition to propylene glycol methyl ether acetate exemplified by Wengenroth et al with reasonable expectation of reproducing structural details in the submicron range based on the teachings of Wengenroth et al.

Conclusion

11. THIS ACTION IS MADE FINAL.

a. Claim 22 was rejected over Sinta et al in view of Daniels et al or Clecak et al. Claim 22 was not rejected over Oshawa et al. Applicant amended claim 1 to include the limitations of claim 22. This amendment did not overcome the rejection over Sinta et al in view of Daniels et al or Clecak et al. Therefore this action is final.

b. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

c. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

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CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

12. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Barbara Gilmore whose telephone number is (703) 305-1330. The examiner can normally be reached on Monday through Thursday from 7:30 AM to 5:00 PM.

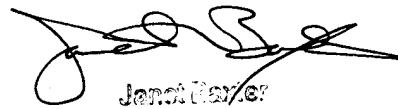
a. If attempts to reach the Examiner by telephone are unsuccessful, the examiner's supervisor, Janet Baxter, can be reached on (703) 308-2303. The fax phone number for the organization where this application or proceeding is assigned is (703) 305-3599.

b. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

BG

BG

January 20, 2000


Janet Baxter
Supervisory Patent Examiner
Technology Center 1700